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(54) Piecing method and device for a spinning machine

(57) Piecing method of a spinning machine whereby, after holding outside a twist device both a leading yarn ejected from the sliver guide entrance of a twist device in a stationary state and a sliver delivered by a re-operated draft device, the twist device is operated, the sliver supplied to the twist device and the fibers comprising the sliver are entangled in the leading yarn pulled from the twist device. The success rate of yarn piecing may be improved without detailed adjustment of the pulling timing of the leading yarn guided into the twist device and the supply timing of the sliver supplied to the twist device.

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Description

Field of the Invention

The present invention relates to a piecing method for joining cut yarn and that device on a spinning machine.

Background of the Invention

A piecing method and a device for such has been developed whereby the winding side yarn end is guided into a twist device of a spinning machine and thereafter, the end of the sliver guided into the twist device and the yarn end of the yarn of the winding side (being the yarn drawn from the yarn package and below, known simply as "leading yarn") guided into the twist device are joined by a spinning process due to the restarting of spinning.

In the above described piecing method of a spinning device, the timing of pulling the leading yarn guided into the twist device and the supply timing of the sliver supplied into the spinning nozzle by the restarting of the backrollers are extremely important for improving the success rate of yarn piecing.

Accordingly, on the above described piecing method, the pull timing of the leading yarn guided into the twist device may become faster than the supply timing of the sliver supplied to the twist device thus meaning the fibers comprising the sliver do not entangle with the leading yarn resulting in a piecing failure or only a small amount of fibers comprising the taper shaped sliver tip entangle with the leading yarn forming a thin yarn piecing part and increasing the occurrence of re-breakage of the yarn.

Summary of the Invention

It is an object of the present invention to propose a piecing method for a spinning machine and that device which increases the success rate of yarn piecing and improves the yarn pieced part without adjustment of the pull timing of the leading yarn guided in the twist device and the supply timing of the sliver supplied to the twist device.

In order to achive the above described object, a first aspect of the present invention is a method whereby, after holding outside a twist device both a leading yarn ejected from the sliver guide entrance of a twist device in a stationary state and a sliver delivered by a re-operated draft device, the twist device is operated, the sliver supplied to the twist device and the fibers comprising the sliver are entangled in the leading yarn pulled from the twist device.

A second aspect is the arrangement on the piecing device of a spinning machine of a means for inserting the leading yarn into the twist device in the stationary state and a suction pipe for sucking and holding both the leading yarn ejected from the sliver guide entrance of the twist device in the stationary state and the sliver delivered by the restarted draft device.

A third aspect of the present invention is the formation in the spindle of an air blowing hole for ejecting the leading yarn inserted in the spindle of the stationary twist device from the sliver guide entrance of the twist device.

Brief Description of the Drawings

Figure 1 is a side view including a partial section of the spinning device being one embodiment applicable to the present invention.

Figure 2 is similarly a side view including a partial section of the spinning device being one embodiment applicable to the present invention.

Figure 3 is similarly a side view including a partial section of the spinning device being one embodiment applicable to the present invention.

Figure 4 is similarly a side view including a partial section of the spinning device being one embodiment applicable to the present invention.

Figure 5 is similarly a side view including a partial section of the spinning device being one embodiment applicable to the present invention.

Figure 6 is a partial expanded section of the twist part.

Figure 7 is a timing chart of the yarn piecing actions of the present invention.

Detailed Description of the Preferred Embodiments

Hereafter, an embodiment applicable to the present invention will be described using the drawings but the present invention is not limited to that described provided the aims of the invention are not surpassed.

Firstly, a spinning device being one embodiment applicable to the piecing method of the spinning machine will be described using Figures 1 and 6.

D is a draft device showing a 4 line type draft device as an example. The draft device D comprises the four lines being back rollers 1, third rollers 2, middle rollers 3 attached with an apron belt and front rollers 4. 5 is a sliver guide and sliver 6 inserted in the sliver guide 5 and supplied to the draft device D is supplied to a twist device which will be described later and produces yarn Y after being supplied to the draft device D and drawn.

A twist device T comprises mainly an air spinning nozzle 7 which produces a spinning air current by the blowing of pressured air, a nozzle block 8 which supports that nozzle 7, a spindle (yarn guide tube) 9 having an insertion hole 9b and of which the tip 9a is positioned in the inner part 7a of the air spinning nozzle 7, and a spindle support member 10 that supports that. The inner part 7a of the air spinning nozzle 7 is the piecing area where joining of the fibers comprising the sliver 6 supplied to the inner part 7a of the air spinning nozzle 7 and the winding side spun yarn Y inserted into the insertion hole 9b of the spindle 9 and guided into the inner part 7a of the air spinning nozzle 7 is carried out.

A plurality of air blowing holes 7b for generating a rotating air current are arranged in the air spinning nozzle 7. 11 is an air chamber formed between the nozzle block 8 and spindle support member 10. The air chamber 11 is connected to an air suction source (not shown in the drawings) that sucks air at a low suction pressure via the suction hole 12 and during spinning, acts as an escape hole for the air blown from the air blowing holes 7b of the air spinning nozzle 7 as well as removing fly fiber waste and the like generated inside the air chamber 11 during spinning.

13 is an air blowing hole arranged in the spindle 9 and spindle support member 10 for generating an air current in the direction of the tip 9a of the spindle 9. The air blowing hole 13 is connected to the compressed air supply source (not shown in the drawings) via a pipe 14 connected to the spindle support member 10.

15 is a slit formed in the side wall of the nozzle block 8 side spindle support member 10. 16 is a slit formed in the side wall of the spindle support member 10 side nozzle block 8 opposite the slit 15 of the spindle support member 10. As described later, when the nozzle block 8 and spindle support member 10 are coupled together, the leading yarn inserted in the insertion hole 9b of the spindle 9 enters the slits 15, 16 and the arrangement is such that it is not trapped by the side wall of nozzle block 8 and the side wall of the spindle support member 10.

17 is a cylinder. A lower frame 19 of the spindle support member 10 is mounted on the tip of a piston rod 18 of the cylinder 17. Accordingly, the cylinder 17 is moved and the spindle support member 10 is able to couple with or separate from the nozzle block 8 by the left and right movements of the lower frame 19.

20 is a suction pipe of which the tip is positioned between the nozzle block 8 and front roller 4 and connected to the suction air source (not shown in the drawings). 21 is a nip roller being freely connectable/separable to the delivery roller 22 which is normally always driven and is so arranged that the spun yarn Y is delivered in the direction of the winding machine (not shown in the drawings) by connecting the nip roller 21 with the delivery roller 22.

When the spinning machine is spinning yarn Y, the sliver 6 supplied to the draft device D via the sliver guide 5 is twisted by the twist device T after being drawn by the draft device D and forms a yarn Y. In short, the fibers comprising the sliver 6 supplied to the air spinning nozzle 7 of the twist device T enter the insertion hole 9b of the spindle 9 from the tip 9a while being rotated by a rotating air current blown from the air blowing holes 7b and a yarn Y is produced. In this way, under normal spinning machine operating conditions, supply of the compressed air from the air blowing hole 13 stops, the suction pipe 20 operates and accordingly, normally, suction air is generated in the suction pipe 20.

Next, using Figures 2 to 7, the piecing process will be described.

When a yarn breakage occurs, a detection signal is generated by a detection sensor (not shown in the drawings) and in association with that, supply of the sliver 6 is stopped by stoppage of the driving of the back rollers 1 and third rollers 2 via a clutch (not shown in the drawings) connected to the back rollers 1. The twist device T continues operations as before. The tip of the sliver 6 is then immediately pulled into a tapered shape between the stationary third rollers 2 and still driving middle rollers 3. Furthermore, after a predetermined time period has elapsed, the blowing of air from the air blowing holes 7b is stopped and the operation of the twist device T stopped.

Next, the piston rod 18 is advanced by movement of the cylinder 17, the spindle support member 10 separated from the nozzle block 8 and the head A' of transfer arm member A which grips by a pair of drive rollers 23, 24 the tip of the leading yarn Y' wound onto the winding package and pulled from the winding package by a publicly known suction mouth or the leading yarn Y' pulled from a package prepared for other uses, is positioned in the vicinity of the yarn exit hole 9c of the spindle 9. Conversely, a suction head 25 of an air sucker member S is positioned between the spindle support member 10 and nozzle block 8 such that the tip 9a of the spindle 9 is in the vicinity of the suction hole 26 of the suction head 25.

Thereafter, a suction air current is generated in the suction hole 26 of the suction head 25 and the leading yarn Y' is inserted in the insertion hole 9b of the spindle 9 by operation of the drive rollers 23, 24 of the transfer arm member A. Then the tip of the leading yarn Y' is sucked and held in the suction head 25 of the air sucker member S (Refer to Figure 2).

Next, as shown in Figure 3, the air sucker member S which holds the leading yarn Y' is lowered, the piston rod 18 is retracted by operation of the cylinder 17 and the spindle support member 10 and nozzle block 8 are coupled. Even if the spindle support member 10 and nozzle block 8 couple, the leading yarn Y' is not trapped by the walls of the spindle support member 10 and nozzle block 8 as it enters the slits 15, 16. In association with the lowering of the air sucker member S, the drive rollers 23, 24 are stopped after delivery of a predetermined amount of leading yarn Y' by operation of the drive rollers 23, 24 of the transfer arm member A.

Next, an air current in the direction of the tip 9a is generated in the insertion hole 9b of the spindle 9 by supplying compressed air to the air blowing hole 13 from a compressed air supply source (not shown in the drawings) via a pipe 14. It should be noted that a suction air current is normally generated in the suction pipe 20.

When the suction air current generated in the suction pipe 26 of the air sucker member S is stopped, the lending yarn Y' held in the air sucker member S is inserted in the suction pipe 20, in which is generated a suction air current, by ejection from the sliver guide entrance 7c of the air spinning nozzle 7 being the hole for guidance into the twist device T of the sliver 6, due to the air current generated in the insertion hole 9b of the spindle 9 in the direction of the tip 9a (Refer to Figure 4).

After the leading yarn Y' has been inserted in the insertion hole 9b of the spindle 9 and held in the suction pipe 20, it is preferable for the supply of compressed air to the air blowing hole 13 to stop but when the compressed air blown from the air blowing holes 7b of the air spinning nozzle 7 is strong enough, even if compressed air is blown from the air blowing hole 13, there is no influence on the driving of the twist device T and the supply of compressed air to the air blowing hole 13 need not be stopped.

It should be noted that, in this state as shown in Figure 4, it is preferable for the leading yarn Y' to be gripped by the stationary drive rollers 23, 24 of the transfer arm member A so that surplus leading yarn Y' is not fed out. However, the transfer arm member A may also be returned to a standby position by releasing the holding of the leading yarn Y' by the drive rollers 23, 24 of the transfer arm member A.

It should be noted that the transfer arm member A and air sucker member S has been previously disclosed by the present applicant in the Japanese Patent Application No. Hei 4-325021 (Patent laid Open No. Hei 6-173129) and the Japanese Patent Application No. Hei 6-284269, therefore the specific details of such have been ommitted but if a predetermined amount of leading yarn Y' may be fed out, it is not limited to the above mentioned transfer arm member A and if generation of a suction air current is possible, is not limited to the above mentioned air sucker member S.

Next, while the operation of the twist device T is stopped, in short, while the blowing of air from the air blowing holes 7b is stopped, the stationary back rollers 1 and third rollers 2 restart and when the sliver 6 gripped by the back rollers 1 and third rollers 2 moves, the sliver 6 fed out from the front rollers 4 is inserted in the suction pipe 20. In short, as shown in Figure 5, the leading yarn Y' ejected from the sliver guide entrance 7c of the air spinning nozzle 7 and the sliver 6 fed out from the front rollers 4 are inserted in the suction pipe 20 together. The sliver 6 is sucked into the suction pipe 20 by the continued driving of the draft device D.

As described above, when the leading yarn Y' and sliver 6 drawn by the restarting of the draft device D are sucked together into the suction pipe 20, the leading yarn Y' is pulled in the direction of the winding package by the contact of the nip rollers 21 with the delivery rollers 22 and when air is blown from the air blowing holes 7b, a suction air current stronger than the suction air current of the suction pipe 20 is generated in the vicinity of the sliver guide entrance 7c of the air spinning nozzle 7 so fibers comprising the sliver 6 delivered from the front rollers 4 are guided into the sliver guide entrance 7c of the air spinning nozzle 7 and yarn piecing is performed by entangling with the leading yarn Y' in the internal part 7a of the air spinning nozzle 7 forming the piecing area.

As described above, when the leading yarn Y' and sliver 6 drawn by the restarting of the draft device D are sucked together into the suction pipe 20, as the twist device T restarts, yarn piecing may be reliably performed without reliance on the pulling timing of the leading yarn Y' guided into the twist device T and the supply timing of the sliver 6 to the twist device T by the restarting of the back rollers 1 and third rollers 2.

In the above described embodiment, the spindle support member 10 and nozzle block 8 are comprised so as to be separable and contactable but the spindle support member 10 comprising the twist device T and nozzle block 8 may be a single unit. In that case, after the positioning close to the yarn exit hole 9c of the spindle 9, of the head A' of the transfer arm member A which grips the leading yarn Y', an air current in the direction of the tip 9a is generated in the insertion hole 9b of the spindle 9 by the supply of compressed air to the air blowing hole 13, a suction air current is also generated in the suction pipe 20, the leading yarn Y' is inserted in the twist device T by the operation of the drive rollers 23, 24 of the transfer arm member A and ejected from the sliver guide entrance 7c of the twist device T. Accordingly, in the present embodiment, the air sucker member S may be ommitted.

Due to the construction as described above, the present invention demonstrates the following advantages:

The success rate of yarn piecing may be increased without the need for detailed adjustment of the pulling timing of the leading yarn guided to the twist device and the supply timing of the sliver supplied to the twist device.

As a control means for detailed adjustment of the pulling timing of the leading yarn guided to the twist device and the supply timing of the sliver supplied to the twist device may be ommitted, the piecing device may be simplified.

Claims

1. A piecing method of a spinning machine whereby,

   after holding outside a twist device both a leading yarn ejected from a sliver guide entrance of a twist device in a stationary state and a sliver delivered by a re-operated draft device, the twist device is operated, the sliver supplied to the twist device and the fibers comprising the sliver are entangled in the yarn pulled from the twist device.

2. A piecing device of a spinning machine having,

   a means for inserting the leading yarn into the twist device in the stationary state, and
   a suction pipe for sucking and holding both the leading yarn ejected from the sliver guide entrance of the twist device in the stationary state and the sliver delivered by the restarted draft device.

3. A piecing device of a spinning machine as in claim 2 comprising in the spindle an air blowing hole for ejecting the leading yarn inserted in the spindle of the stationary twist device from the sliver guide entrance of the twist device.

FIG. 1

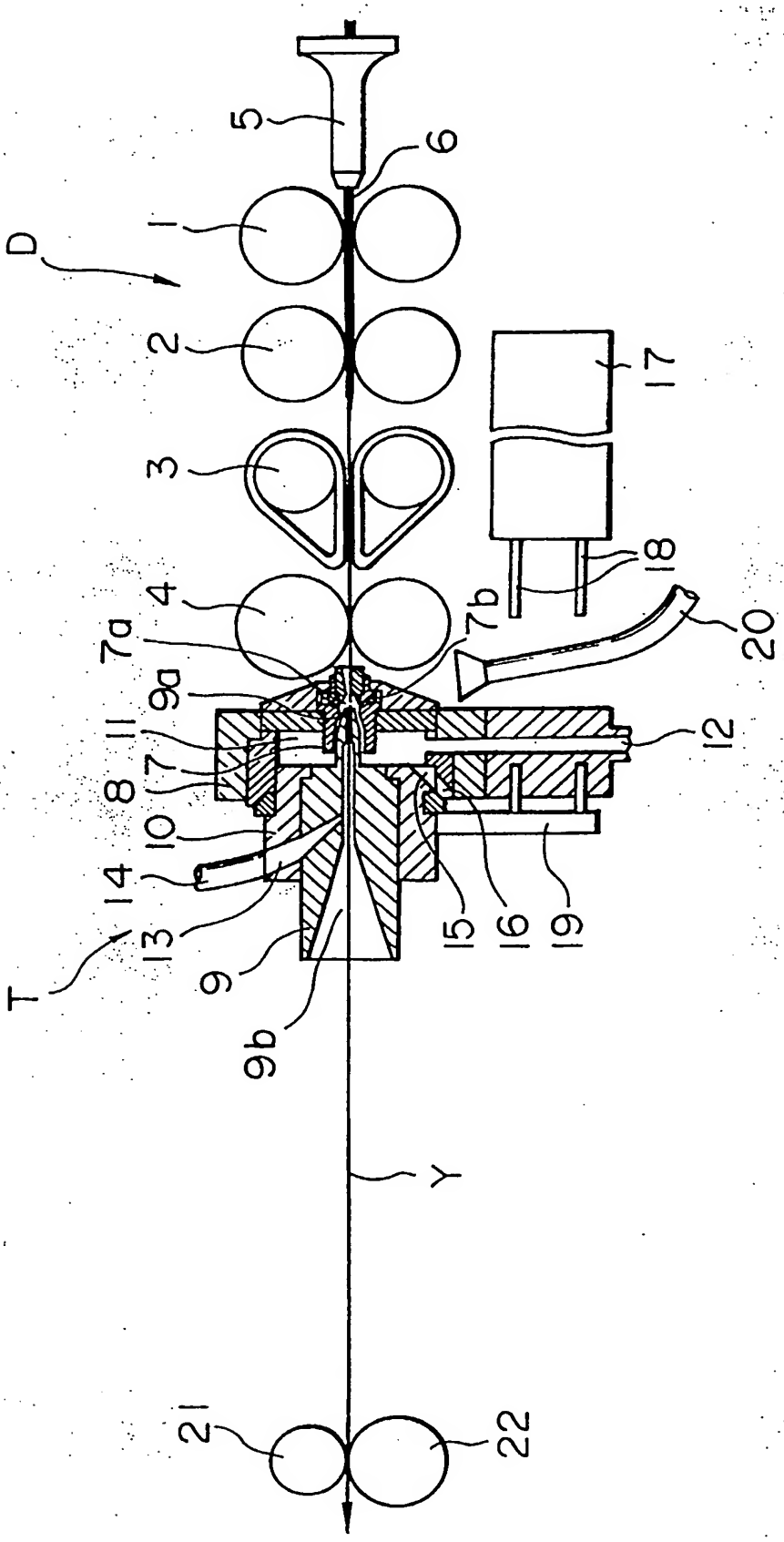

FIG. 2

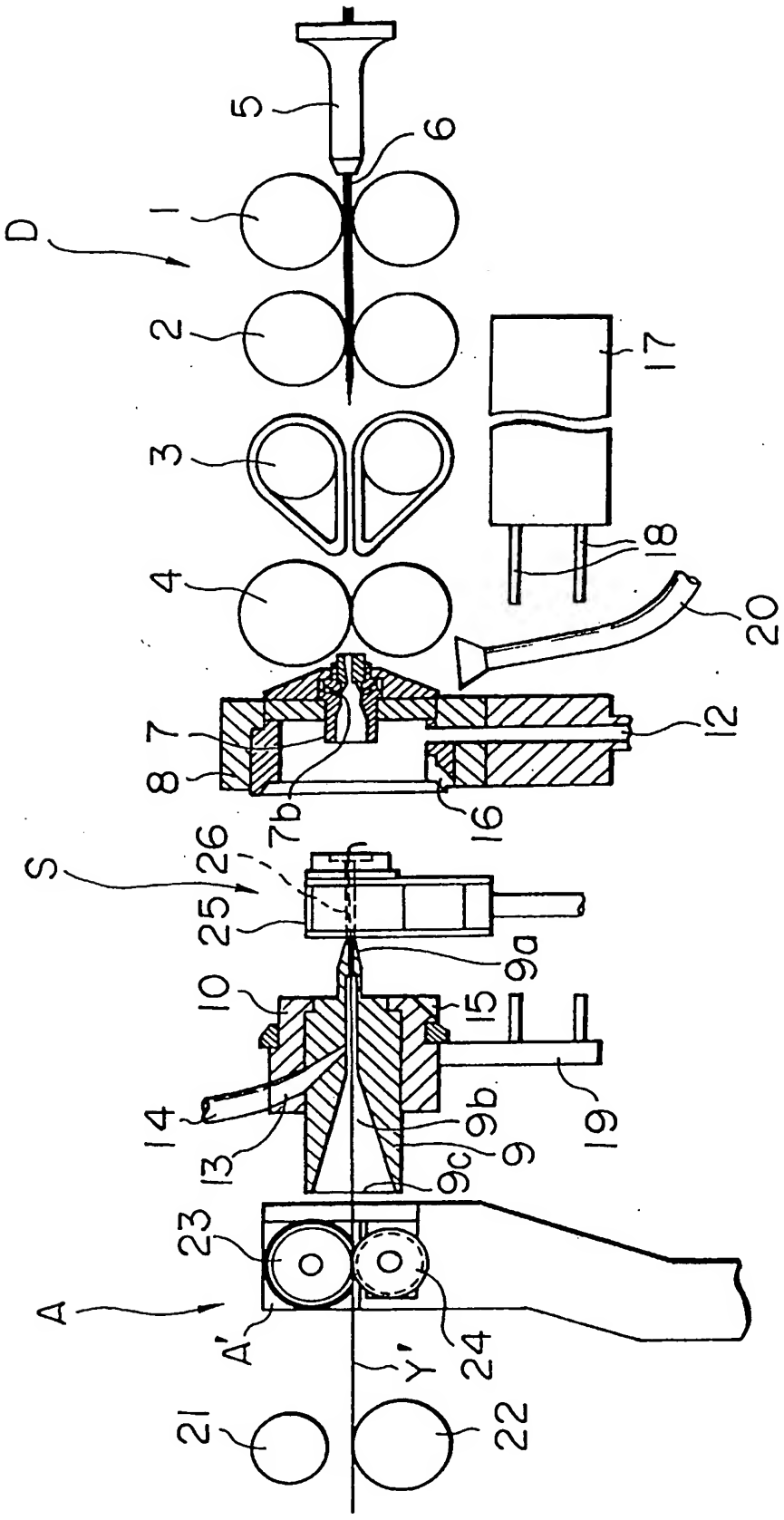
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FIG. 3

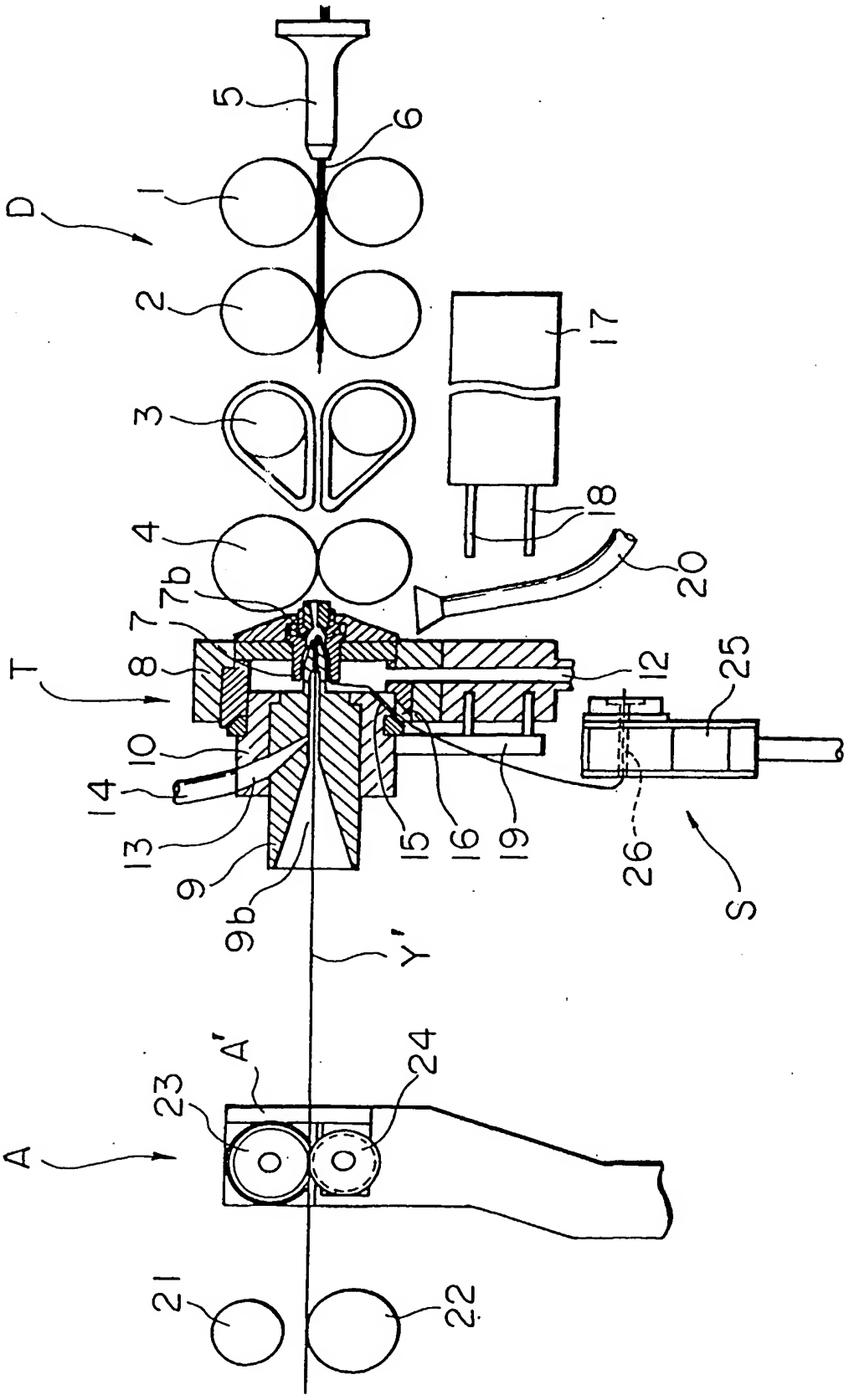
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FIG. 4

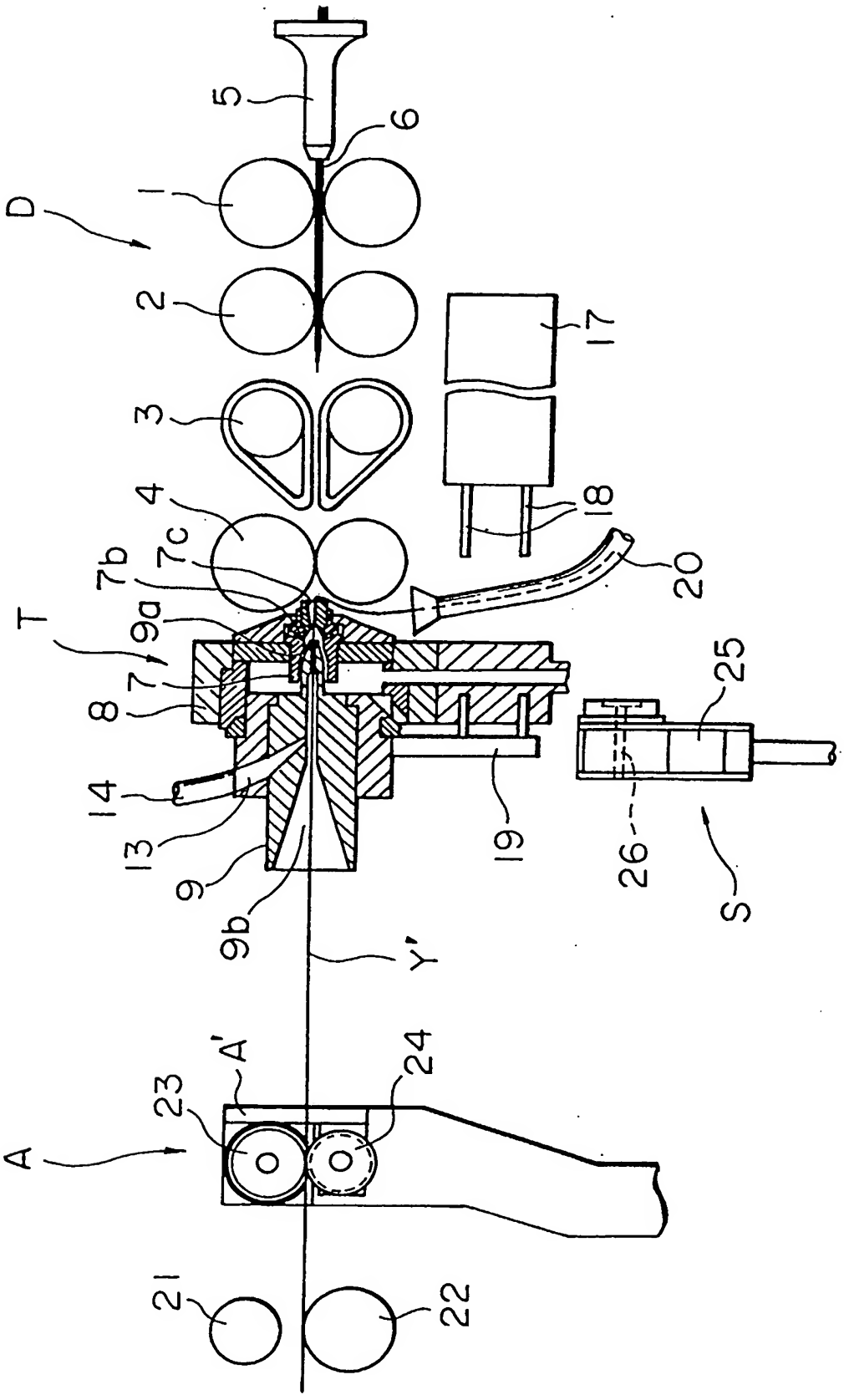


FIG. 5

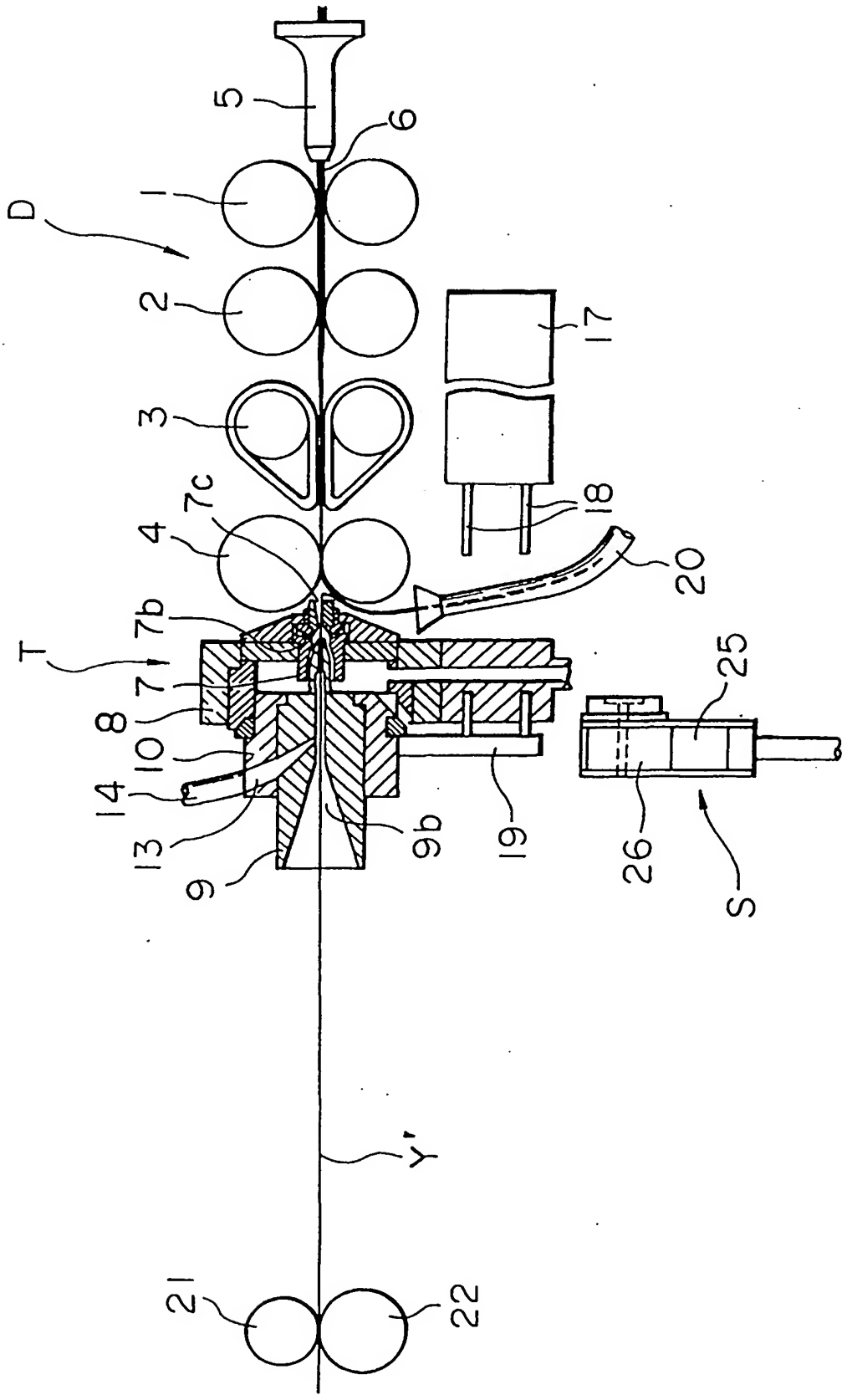


FIG. 6

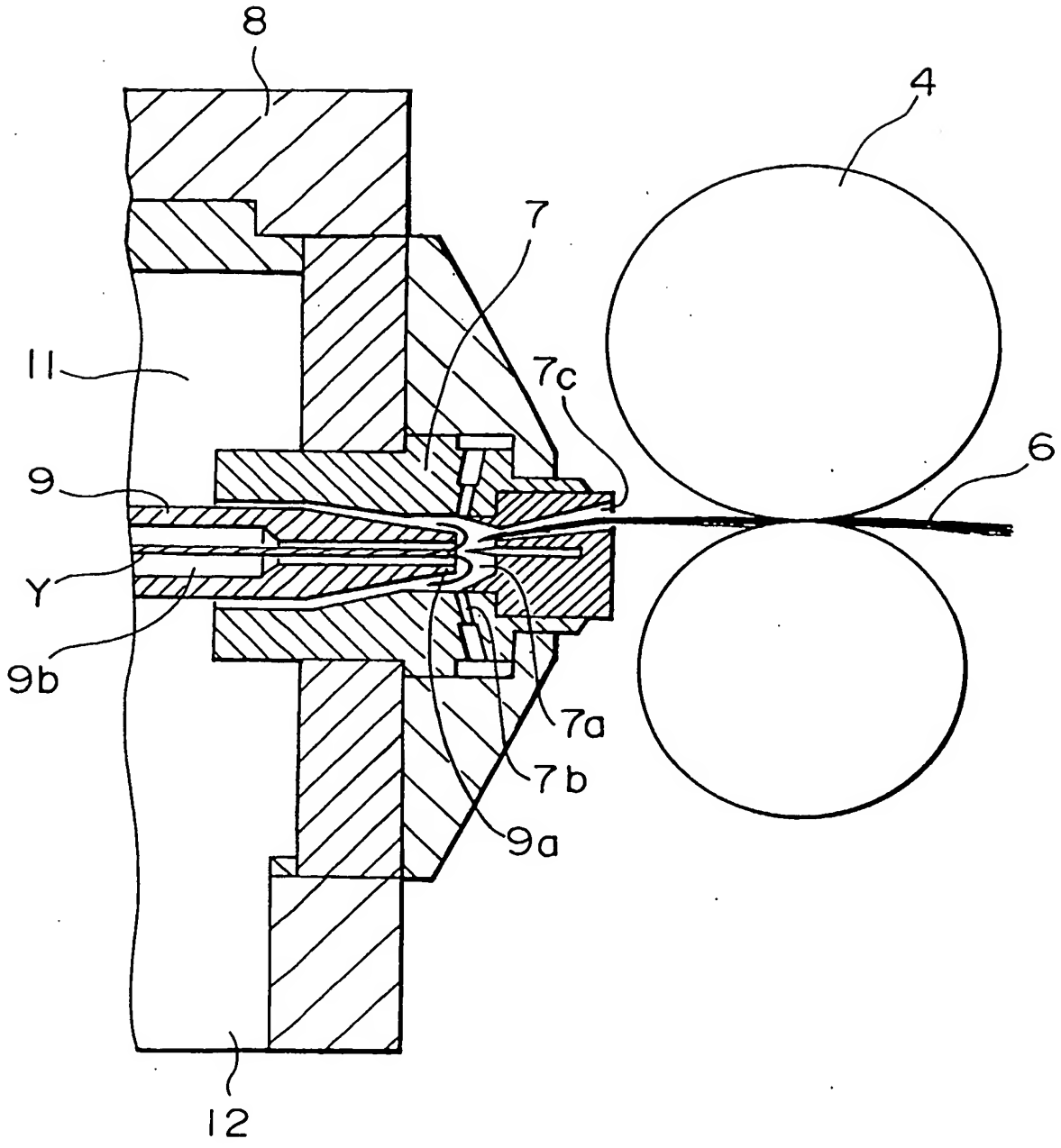
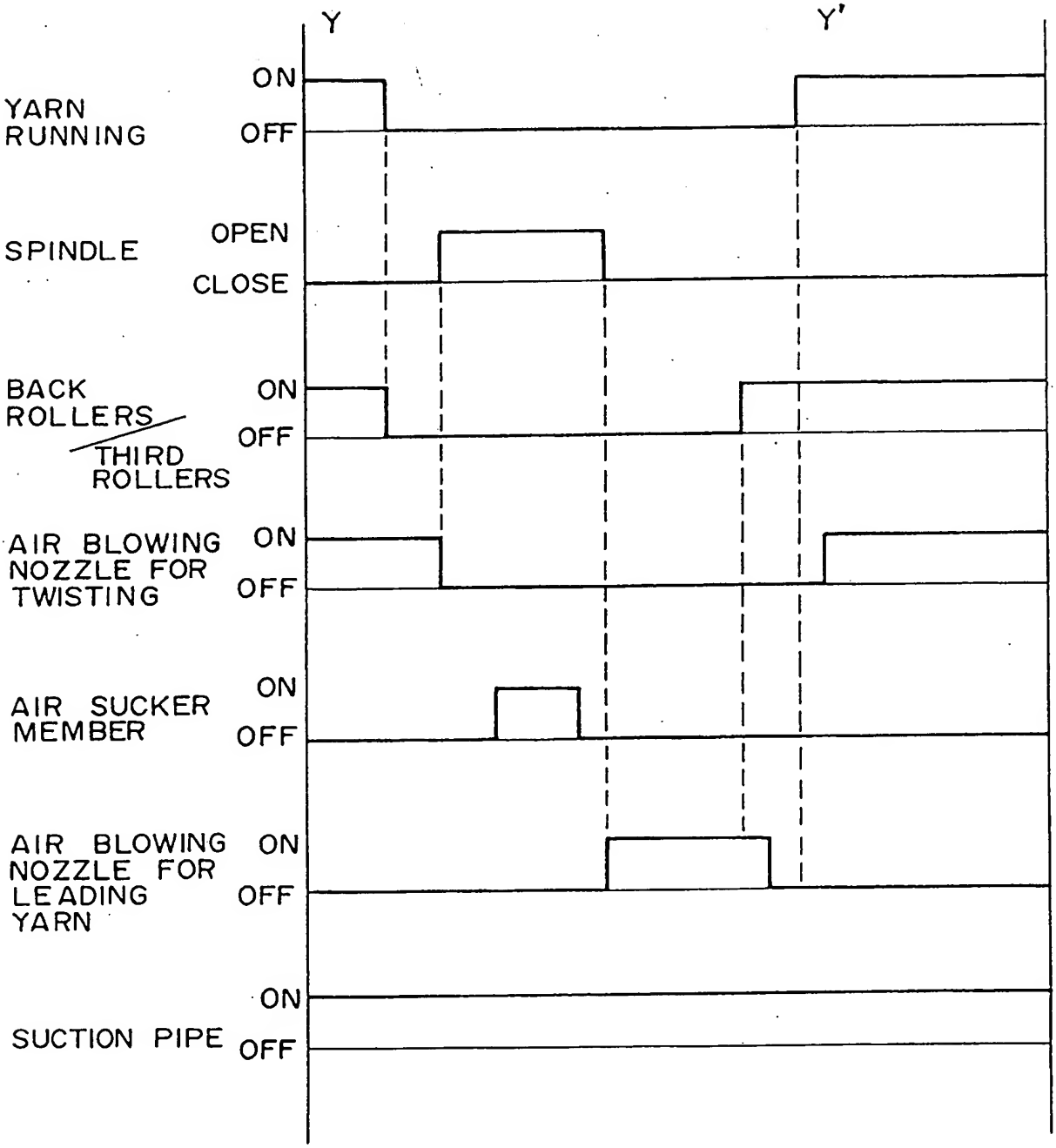


FIG. 7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